



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>G06K 9/40</b>		<b>A1</b>	(11) International Publication Number: <b>WO 00/16249</b>
			(43) International Publication Date: 23 March 2000 (23.03.00)
(21) International Application Number: <b>PCT/US99/21067</b> (22) International Filing Date: <b>13 September 1999 (13.09.99)</b> (30) Priority Data: 60/100,136                      14 September 1998 (14.09.98)      US (71) Applicant (for all designated States except US): <b>UNIVERSITY OF UTAH RESEARCH FOUNDATION [US/US]; 210 Park Building, Salt Lake City, UT 85112 (US).</b> (72) Inventors; and (75) Inventors/Applicants (for US only): <b>PORTNIAGUINE, Oleg, N. [RU/US]; Apartment H, 5328 South 570 East, Salt Lake City, UT 84107 (US); ZHDANOV, Michael, S. [RU/US]; 4740 South Bron Breck, Salt Lake City, UT 84117 (US).</b> (74) Agents: <b>BOND, Laurence, B. et al.; Trask, Britt &amp; Rossa, P.O. Box 2550, Salt Lake City, UT 84110 (US).</b>			(81) Designated States: <b>CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b>  <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: METHOD OF DIGITAL IMAGE ENHANCEMENT AND SHARPENING

## (57) Abstract

A method of digital image enhancement and sharpening (11, 12) which may be applied to restoration of blurred digital images of arbitrary origin. The method uses a specially formulated constraint (15) to reconstruct the original images. In particular, the constraint of the present method minimizes the area where strong image parameter variations and discontinuities occur. This new constraint is called a minimum gradient support (MGS) constraint. The MGS constraint generates a stable sharp solution of the linear ill-posed image restoration equation with an arbitrary blurring operator.

